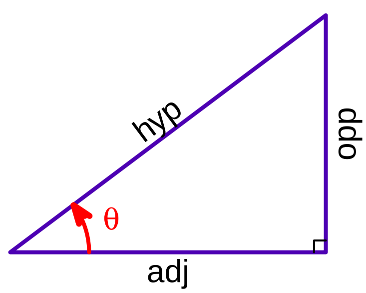
Right-triangle trigonometry cheat sheet

- On a right triangle with a marked acute angle, we can identify the leg **opposite** the marked angle by starting at the angle, drawing a line through the center of mass of the triangle, and continuing until hitting a side.
- The **hypotenuse** is opposite the right angle, and the hypotenuse is always the longest side of a right triangle.
- The **adjacent** leg is the leg (not hypotenuse) that touches the marked angle.
- Below I've drawn a right triangle in standard orientation, but in problems, the right triangle is often rotated and reflected, so it is important to have a process for identifying the hypotenuse, and whether a leg is opposite a given angle or adjacent a given angle.



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$$\sin(\theta) = \frac{\text{opp}}{\text{hyp}} \qquad \text{opp} = \text{hyp} \cdot \sin(\theta) \qquad \text{hyp} = \frac{\text{opp}}{\sin(\theta)} \qquad \theta = \arcsin\left(\frac{\text{opp}}{\text{hyp}}\right)$$

$$\cos(\theta) = \frac{\text{adj}}{\text{hyp}} \qquad \text{adj} = \text{hyp} \cdot \cos(\theta) \qquad \text{hyp} = \frac{\text{adj}}{\cos(\theta)} \qquad \theta = \arccos\left(\frac{\text{adj}}{\text{hyp}}\right)$$

$$\tan(\theta) = \frac{\text{opp}}{\text{adj}} \qquad \text{opp} = \text{adj} \cdot \tan(\theta) \qquad \text{adj} = \frac{\text{opp}}{\tan(\theta)} \qquad \theta = \arctan\left(\frac{\text{opp}}{\text{adj}}\right)$$

Pythagorean Identities

$$\text{adj}^2 + \text{opp}^2 = \text{hyp}^2 \qquad \text{hyp} = \sqrt{\text{adj}^2 + \text{opp}^2} \qquad \text{adj} = \sqrt{\text{hyp}^2 - \text{opp}^2} \qquad \text{opp} = \sqrt{\text{hyp}^2 - \text{adj}^2}$$

$$\sin^2(\theta) + \cos^2(\theta) = 1 \qquad \sin(\theta) = \sqrt{1 - \cos^2(\theta)} \qquad \cos(\theta) = \sqrt{1 - \sin^2(\theta)}$$